Beryllium History Sitewide

Craig Clairmont, Industrial Hygiene Manager

October 19, 2004

History of Beryllium Usage

- Earliest use at Hanford about 1952.
- Limited experimental work in 1950s.
- Production operations including machining began around 1960.
- Production work ceased in 1987, when virtually all beryllium operations (outside a laboratory) ceased.

Historic Beryllium Usage Information

- 313 and 333 facilities doing production work.
- 5 facilities involved in machining (272-W, 306-W, 325, 328, 3731-A).
- 9 facilities in pilot operations (231-Z, 303-F, 308, 314, 326, 327, 1706-KE, 3706, 3720).
- 42 other facilities “associated” with beryllium, but had little exposure potential.

Historic Beryllium Exposure Control

- Hazards of beryllium recognized by DOE from start.
- Airborne beryllium monitoring in 1952.
- Exposure limit was 2 ug/m3.
- Program to control exposures was put in place in 1966 or before.
- Hanford Environmental Health Foundation (HEHF) had “Safe Practices Guide”.
- Contractor had Be Control Procedure.
- Established Control Zones for Be exposure areas. (such as lines painted on the floors)

Historic Beryllium Exposure Monitoring

- Monitoring performed during incidents and routinely in production areas.
- Both airborne and wipe sampling.
- Most airborne sampling were area.
- Some personal sampling performed.

End of Beryllium Production

- Be production work discontinued 1987
- Be production facilities decontaminated, but little information on the extent of the decontamination.
- Some sampling performed to establish that Be had been cleaned up.
- No known Be production work since 1988.

Recent Activities Involving Beryllium

- Laboratory Operations (analyses and PNNL research operations).
- Work with beryllium-alloy tools.
- Possible contact with residual beryllium contamination in facilities. ("UNLIKELY" in most facilities)
- Site CBDPP implemented in 1998.
- List of suspect facilities prepared 1998.
- Beryllium Awareness Group formed.

Laboratory Operations

- Very limited and closely controlled.
- Primarily at PNNL except Be analyses.
- Not considered as being a significant source of beryllium exposure.

Beryllium-Alloy Tools

- Used at various sites at Hanford.
- Considered to be low potential exposure.
- Use discontinued in early 2002 by all Hanford site contractors except PNNL.

Possible Be Contamination

- Possible residual beryllium contamination from past operations.
- List of about 60 facilities with “possible” beryllium contamination prepared. (31 of 60 managed by Fluor)
- List prepared based on records review, personnel interviews, etc.
- Many facilities had very low or no potential for exposure.

NOTE: Hanford used a very, very low threshold of credibility for placing a facility on the list of beryllium suspect facilities. Unverified claims, second and third hand oral history and other such information was all accepted in order to generate the Hanford “universe of possible beryllium facilities”.

Beryllium Characterization

- Initial characterization of FH facilities performed in 1999.
- Additional facilities subsequently added to list of facilities with possible contamination.
- Initial characterization completed on facilities with possible beryllium contamination.
- 1 facility had surf. cont > 3 ug/100cm2 (333).
- 5 facilities surf. cont. > MDL (0.2 or 0.5 ug/100cm2) (313, 324, 334A, 350, 3716).

Wipe Sampling Detection Limit

- Original (1999) characterization levels:
  - ✓ MDL – 0.5 ug/100 cm2 (method limit).
  - ✓ Hanford 1999 limit – 1.0 ug/100 cm2.
- 10 CFR 850 (2000):
  - ✓ No specified level for facility characterization.
  - ✓ Equipment release level - 0.2 ug/100 cm2.
- Recent characterization sampling performed with MDL of 0.2 ug/100 cm2.

Recent Characterization Effort

- All facilities with evidence of past, recent or current beryllium contamination characterized.
- Additional sampling performed in selected areas of facilities based on work being performed in area.
- Did not attempt to “re-characterize” all facilities sampled in 1999 as many of these facilities were closed and locked.

Facilities Characterized since 1999

- Characterization performed based on facility activity.
- Characterization performed with MDL of 0.2 ug/100 cm2.
- FH Facilities characterized to the 0.2 ug/100 cm2 level: 272-W, 303-C, 303-J, 306-E, 313, 314, 328, 350, 3708, 3745-B.

CBDPP at Hanford

- Initially implemented in 1998.
- FH appointed by DOE to coordinate.
- Have “Site Level CBDPP”.
- Each contractor has implementing document for their specific work type.
- HEHF (now AMH) has medical support plan to support CBDPP.

Fluor Hanford CBDPP

- Consists of two documents.
- Site level CBDPP:
  - ✓ Provides consistency between contractors in areas such as facility postings.
  - ✓ Provides standard definitions such as beryllium contamination.
- Contractor CBDPP:
  - ✓ Provides details of program implementation.

Definitions in Hanford CBDPP

- Based on 10 CFR 850, but provides several new definitions:
  - ✓ Beryllium assigned worker.
    a current worker assigned to perform work that is anticipated to involve exposure to airborne beryllium at or above 0.01 ug/m3
  - ✓ Beryllium affected worker.
    an individual who has been diagnosed with beryllium sensitization or chronic beryllium disease
  - ✓ Beryllium-contaminated material.
    Used in beryllium production work, or discovered to have surface contamination levels greater than 0.2 ug/100 cm2 or the background level for local soils (dust), whichever is greater.
  - ✓ Beryllium facilities list.
    listing of locations where the presence of beryllium has been evaluated; equivalent to the baseline beryllium inventory required in 10 CFR 850.20.

Hanford CBDPP versus 10 CFR 850

- Goes beyond 10 CFR 850 in many areas:
  - ✓ Defines “beryllium exposure” as airborne beryllium exposure > 0.01 ug/m3.
  - ✓ Creates beryllium assigned workers who will perform all work with Be exposure.
    - Medically qualified and trained for Be work.
  - ✓ Defines beryllium contamination as >0.2 ug/100 cm2 and uses for evaluating buildings.

Employee Protection

- Beryllium-affected workers are offered a medical restriction from airborne beryllium exposure and can opt out of work in beryllium suspect facilities.
- Prior to work in a facility with evidence of past beryllium usage, a job hazard analysis will be performed.
- Work with airborne beryllium exposure done by Be assigned workers only.

Hanford Be Programs and Supporting Programs

- Site CBDPP.
- FH Implementing Procedure (6155).
- FH Be Management Plan (19326).
- Automated Job Hazard Analysis.
- Accommodation of Work Restrictions.
- Employee Job Task Analysis.
- Respiratory and Personal Protection Programs.
- Written IH Sampling Plans
- Written plans prior to release or transfer of equipment from beryllium suspect facilities.

Be Sampling Information

- Exposure monitoring results provided to employees in writing and/or posted.
- Field file contains all sampling data (wipe, bulk and airborne) for facility.
- Exposure database (HIH2) functions as repository for exposure monitoring results and provides summary reports.

Goals of Current FH Beryllium Philosophy

Suspect ⇒ Known, Likely, Unlikely or No Evidence

Facility-wide ⇒ Specific areas

Occupied ⇒ Vacant

K_F → KNOWN to contain current, non-natural beryllium surface contamination.
(Using MARSSIM's sampling techniques, recent wipe sample results > 0.2 µg/100 cm^2 or recent air sample results > 0.2 µg/m^3) → **K_A**

L_F → LIKELY to contain current, non-natural beryllium contamination.
(Past, prior to 1999, beryllium particulate-generating activities are known to have occurred and/or past wipe sample results > 0.2 µg/100 cm^2 are documented. Also applies to facilities with past beryllium air sample results > 0.2 µg/m^3) → **L_A**

U_F → UNLIKELY to contain current, non-natural beryllium contamination.
(No credible evidence of past beryllium particulate-generating activities or no recent or past wipe sample results > 0.2 µg/100 cm^2 are documented. Anything that falls between L_F and N_F) → **U_A**

N_F → NO evidence of past or current beryllium use. → **N_A**

F Refers to facility-wide information

A Refers to area-specific information